

# MONTANA CLINICAL COMMUNICATION AND SURVEILLANCE REPORT



Montana Department of Public Health and Human Services  
Chronic Disease Prevention and Health Promotion Program  
Room C314, Cogswell Building - PO Box 202951  
Helena, Montana 59620-2951

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## DEATHS FROM DIABETES AMONG YOUNG ADULTS IN MONTANA, 1998-2007.

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Deaths From Diabetes Among Young Adults In Montana, 1998-2007.

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##### Save the Date!

- Montana Annual Diabetes – “Diabetes Care in Montana 2009: Back to Basics” Professional Conference
- Cardiovascular Health Summit

## BACKGROUND

Diabetes is one of the most common chronic diseases in persons of all ages. Mortality from diabetes generally is caused by cardiovascular disease, kidney disease or some other chronic progressive complication and occurs primarily in older individuals. Acute metabolic deaths from diabetes are much less common in the older individuals than deaths from the chronic complications. Yet studies of specific cohorts of young individuals with diabetes show that death rates for young people with diabetes are two to threefold higher than the rates for young people of the same age who do not have diabetes.<sup>1-3</sup> The causes of death among young people with diabetes included ketoacidosis and hypoglycemic coma. Others were found dead and no anatomical lesions were found at autopsy, suggesting that hypoglycemia may have been involved. Although diabetes rates increase with age, many young people in the United States have diabetes.

Understanding and estimating mortality in people with diabetes is complicated. The physician completing the death certificate can list up to 20 factors contributing to death. Diabetes is often listed as a contributing cause of death when the individual actually died from heart disease or renal disease. Conversely, diabetes is not likely to be mentioned as a contributing cause if it is not part

of the sequelae leading to death; for example, a person with diabetes dying in a motor vehicle crash. It is estimated that diabetes is listed on the death certificate only 35-40% of the time a person with diabetes dies. Thus, all cause mortality rates among persons with diabetes are likely underestimated.

This surveillance report summarizes mortality data from Montana and includes a focused review of deaths in young people in Montana from 1998 to 2007. It is estimated that 2,000 individuals aged 18 to 29 have a diagnosis of diabetes, the majority of which likely have type 1 diabetes. Because deaths from hypoglycemia and ketoacidosis should be preventable, we reviewed circumstances of death in young people where diabetes was listed as an underlying or contributing cause of death to identify high risk situations for young people with diabetes.

## METHODS

Cases were identified from Montana death certificate data from 1989 to 2008, where age of death was between 18 and 29 years of age. Using SQL code PRXMATCH, underlying and contributing cause of death fields were searched for ICD-9 code 250 and ICD-10 codes E10-E14. Using this method, 21 cases were ascertained. Paper copies of the death certificates were obtained from the Montana Office of Vital Statistics. The death certificates were examined for other causes, time and place of death, as well as other co-morbid conditions and demographic variables.

Death records were also used to estimate the diabetes and all cause death rates for the 18-29, 30-39, 40-49, 50-59, 60-69, 70-79, 80 and over

age groups. Population estimates for these age groups were obtained from the National Center for Health Statistics. The population of persons with diabetes was estimated using age-specific prevalence estimates obtained from the Behavioral Risk Factor Surveillance Survey. The population of persons with diabetes under age 18 was estimated using the national prevalence of 0.22%.

Acute metabolic deaths classified as those where the death certificate included an ICD-9 or ICD-10 code for hypoglycemia or ketoacidosis (ICD-9: 250.1, 250.2, 251.1 251.2; ICD-10: E10.0, E10.1, E11.0, E11.1, E12.0, E12.1, E13.0, E13.1, E14.0, E14.1, E15, E16.0-E16.2). Deaths due to cardiovascular disease were those coded as ICD-9 390-448 or ICD-10 I00-I78. Cancer deaths were classified as those with ICD-9 codes 140-208 or ICD-10 codes C00-C97. Chronic lower respiratory deaths were those with an ICD-9 code of 490-496 or ICD-10 codes J40-J49 or J67. Deaths due to accidents were those with an ICD-9 code E850-E949 or ICD-10 code X10-X50. Deaths due to motor vehicle crashes were those coded as ICD-9 E800-E848 or ICD-10 V00-V99.

## RESULTS

The age-adjusted mortality rate where diabetes is listed as the underlying cause of death has remained stable in Montana at approximately 23 per 100,000 population since 2000. Including deaths where diabetes is mentioned anywhere on the death certificate increased the age-adjusted mortality rate to 43 per 100,000 population. (A more comprehensive discussion of diabetes mortality in Montana can be found in *Diabetes: The Burden in Montana*, accessible

online at <http://www.dphhs.mt.gov/PHSD/Diabetes/diabetes-index.shtml>.)

Age specific, all-cause mortality rates were similar when comparing deaths in all Montanans to deaths in Montanans with diabetes, except in age groups 1-17, 30-39 and 40-49, where the mortality rate was higher among people with diabetes (Table). It should be noted, however, that due to limitations of death certificates, the mortality rate among people with diabetes may be underestimated 60-70%.

### Percent of deaths due to acute metabolic complications

Acute metabolic complications (ketoacidosis and hypoglycemia) are the second most common cause of death for people with diabetes under the age of 30, but a rare cause of death among people with diabetes age 50 and over. Fortunately, there were few deaths among children 1 to 17 years old with diabetes over the past 9 years. However, acute metabolic complications were the cause of 60% of these deaths (3/5) (Figure 1a). Among young people

with diabetes, aged 18-29, 33% of deaths were due to acute metabolic complications (Figure 1b). Prevalence of acute metabolic deaths dropped 75%, to 9% of deaths among people with diabetes in age groups 30 to 39 and 40 to 49 years old. Cardiovascular disease gradually replaced acute metabolic complications as the second most common cause of death among people over age 30 with diabetes. Among 30 to 39 year olds with diabetes, the percent dying of cardiovascular disease was similar to the percent dying of acute metabolic complications (Figure 1c). Among 40 to 49 year olds with diabetes, cardiovascular disease was nearly 3 times as likely to be the cause of death as acute metabolic complications (Figure 1d). Acute metabolic complications accounted for only 1% of deaths among people over age 50 with diabetes; however, cardiovascular disease accounted for a third of all deaths in this age group (Figure 1e).

By contrast, motor vehicle crashes, suicide, and accidents were among the top causes of death for all Montanans under the age of 40.

**Table: Age specific death rates among Montanans and Montanans with diabetes, 1998 to 2007.**

Age group	Total deaths	Mortality rate/10,000 people	Diabetes deaths	Mortality rate/10,000 people with diabetes
1-17	773	3	5	11
18-29	1,833	13	21	14
30-39	1,801	16	57	30
40-49	4,177	29	209	44
50-59	7,159	58	578	63
60-69	10,951	142	1,035	103
70-79	19,163	349	1,979	268
80+	38,824	1,082	3,089	955

Cardiovascular disease, cancer, motor vehicle crashes, and suicide were the top causes of death for Montanans age 40 to 49. For Montanans over 50 years old, chronic diseases accounted for most deaths, led by cardiovascular disease, cancer and chronic lower respiratory disease (Data not shown).

### **Deaths in young people with diabetes**

#### **Causes of death**

Between 1998 and 2007, 21 deaths among young adults aged 18-29 listed diabetes on the death certificate. Acute metabolic complications were the cause of seven young adult deaths (33%). Of these, five deaths listed ketoacidosis and two deaths listed hypoglycemic brain damage where the individuals died after being in prolonged comas. Five deaths listed diabetes mellitus, complications of diabetes mellitus, juvenile diabetes or insulin-dependant diabetes (24%). Two young adults died of cardiac arrhythmia (10%). Three died of congestive heart failure or cardiac arrest preceded by coronary atherosclerosis (14%). One death was attributed to asphyxia, secondary to falling related to a seizure. Another died of pneumonia. One death was due to a gastrointestinal bleed. And one person died of alcohol poisoning. Alcohol was mentioned as a contributing cause of death in one additional case. Anecdotally, alcohol was said to have been a factor in one other death; thus, the role of alcohol in diabetes deaths among young people may be underreported.

#### **Time and place of death**

Over half (12/21) of the diabetes deaths in young people occurred at the decedent's residence (57%). Two people died in the ER and one was pronounced dead on arrival (10%).

In nearly all of these cases, the time of death was between 11 pm and 8 am. Six died in the hospital, most often in the late afternoon or early evening (29%).

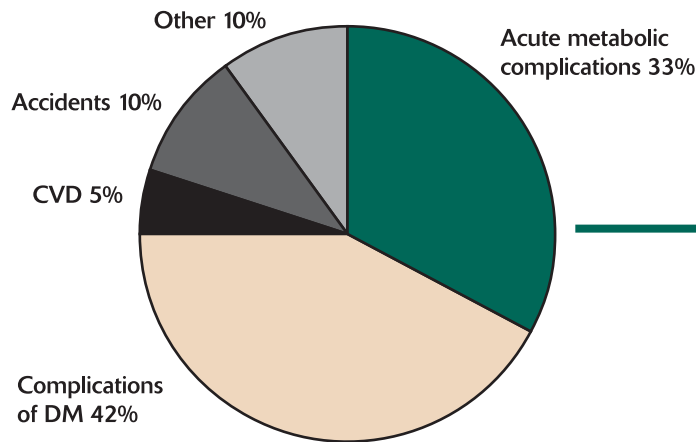
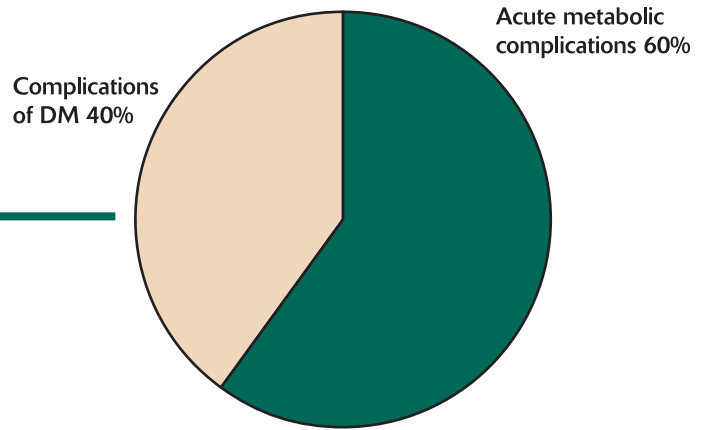
## **DISCUSSION**

Diabetes mortality in Montana has remained stable since 2000. Most deaths in people with diabetes occur among those over 60 years of age, and largely involve other chronic diseases, chiefly cardiovascular disease. Among young adults with diabetes, however, causes of death were very different from older people with diabetes- cardiovascular disease was a rare cause of death, but acute metabolic complications were common causes.

Based on available data from Montana death records, the mortality rate among all 18 to 29 year olds in Montana and 18-29 year olds with diabetes from 1998 to 2007 were the same. However, mortality among 18-29 year olds with diabetes was likely underestimated. Based on incidences in this time period for this age group, it is estimated that seven motor-vehicle deaths and three suicides were misclassified as non-diabetes deaths. Although the death rates in young people were relatively low, young adults with diabetes have a higher burden of mortality than their peers, largely due to acute metabolic complications.

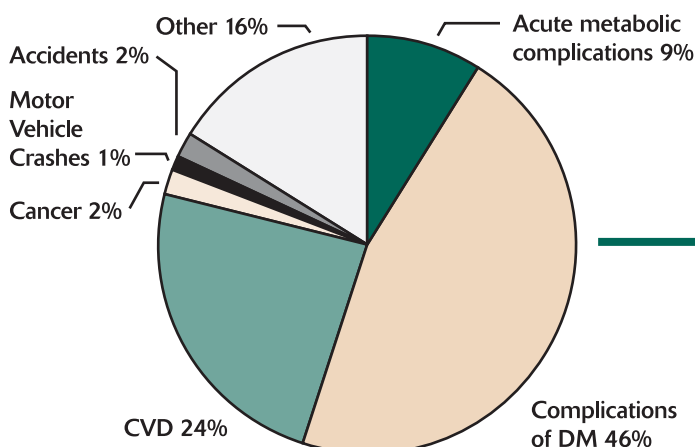
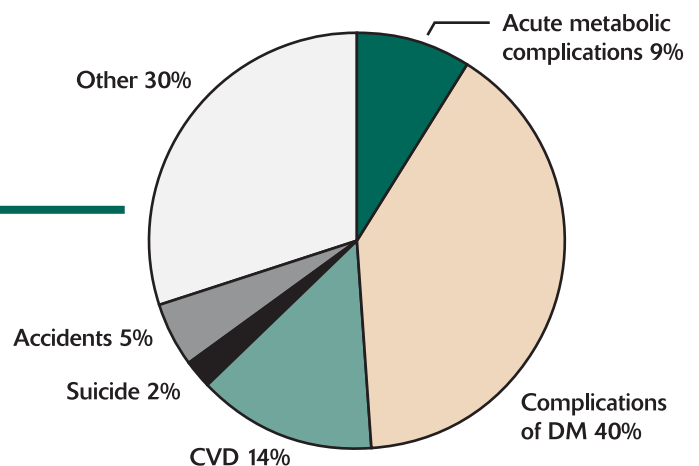
The deaths among young adults with diabetes in Montana are particularly troubling. The data suggest that young people with diabetes in Montana are at risk in the same ways that have been previously described.<sup>1-3</sup> Youth with diabetes face challenges as they mature and leave home, whether bound for college or work.

**Figure 1a. Underlying causes of death among persons with diabetes listed on the death certificate aged 1 to 17 years, Montana 1998-2007.**



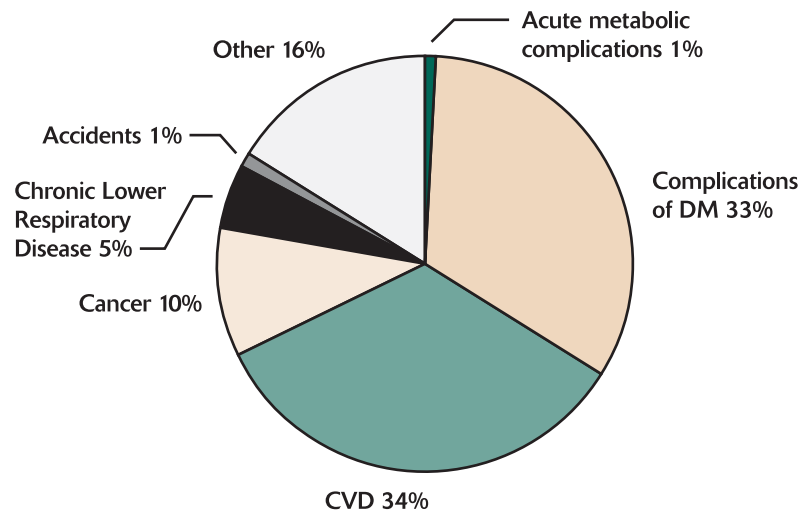
**Figure 1b. Underlying causes of death among persons with diabetes listed on the death certificate aged 18 to 29 years, Montana 1998-2007.**

**Figure 1c. Underlying causes of death among persons with diabetes listed on the death certificate aged 30 to 39 years, Montana 1998-2007.**



**Figure 1d. Underlying causes of death among persons with diabetes listed on the death certificate aged 40 to 49 years, Montana 1998-2007.**

**Figure 1e. Underlying causes of death among persons with diabetes listed on the death certificate aged 50 years or older, Montana 1998-2007.**



In response to several deaths in the United Kingdom, investigators articulated several key recommendations which are widely applicable.<sup>4</sup> When physicians and diabetes educators know that a young adult with diabetes is going away to school or work, it is a good time to re-educate about the risks of hypoglycemia and the potential adverse effects of alcohol and drugs, as well as review sick day management to prevent diabetic ketoacidosis. Young adults with diabetes, particularly students living alone, should develop a reliable friend or colleague and maintain regular contact with the person. Also, they should be encouraged to connect with diabetes support resources in their new environment.

## ADDENDUM

In conclusion, this report highlights the opportunity to prevent metabolic deaths from diabetes in Montanans of all ages. Diabetes educators and education programs are now

available in many Montana communities and can be accessed by contacting the local clinic or hospital outpatient diabetes education department. For a list of ADA-recognized diabetes education programs in Montana, go to [http://professional.diabetes.org/erp\\_zip\\_search.aspx](http://professional.diabetes.org/erp_zip_search.aspx). Montana also has a very active diabetes education professional organization (MT chapter of the American Association of Diabetes Educators, or MAADE). Montana members of this group can be found at <http://www.diabeteseducator.org/DiabetesEducation/Find.html>. Diabetes educators can help the young adult with diabetes who is preparing to leave home for school or work negotiate the challenges they will face. This education should not be confined to diabetes, but should also address the antecedents of the major causes of death among all young people (accidents, motor vehicle crashes and suicide) by stressing injury prevention, seatbelt use, moderate alcohol consumption and where to find mental health support. Also, finding a diabetes educator in the



community in which they will be working or attending school can provide a vital safety net for these potentially vulnerable young people. The move away from home often comes at a time in which young people are still developing emotionally and physically, and desire increased independence and new experiences. We have an obligation as health professionals to ensure that everything possible be done to ensure their safety and prevent the recurrence of tragic outcomes.

## REFERENCES

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<sup>2</sup> Sartor G, Dahlquist G. Short-term mortality in childhood onset insulin-dependent diabetes mellitus: a high frequency of unexpected deaths in bed. *Diabetic Medicine* 1995; 12:607-611.

<sup>3</sup> Tattersall RB, Gill GV. Unexplained deaths of type 1 diabetic patients. *Diabetic Medicine* 1990; 8:49-58.

<sup>4</sup> Strachan MWJ, MacCuish AC, Frier BM. The care of students with insulin-treated diabetes mellitus living in university accommodation: scope for improvement? *Diabetic Medicine* 2000; 17:70-73.

## SAVE THE DATE

### **MONTANA DIABETES ANNUAL PROFESSIONAL CONFERENCE – “DIABETES CARE IN MONTANA 2009: BACK TO BASICS” OCTOBER 8-9, 2009**

**Crowne Plaza Hotel - Billings, Montana**

The Montana Diabetes Project's annual professional conference will be held on Thursday, October 8th and Friday, October 9th, 2009 in Billings, Montana at the Crowne Plaza Hotel. For additional information, contact Susan Day at (406) 444-6677 or e-mail [sday@mt.gov](mailto:sday@mt.gov).

### **CARDIOVASCULAR HEALTH SUMMIT APRIL 8-9, 2010**

For additional information, contact Ava Griffenberg at 406-444-5508 or email [agriffenberg@mt.gov](mailto:agriffenberg@mt.gov).

## WHAT ARE THE MONTANA DIABETES PREVENTION AND CARDIOVASCULAR HEALTH PROGRAMS AND HOW CAN WE BE CONTACTED?

The Montana Diabetes Control and Cardiovascular Health Programs are funded through cooperative agreements with the Centers for Disease Control and Prevention and Health Promotion (1U58DP001977-01), the Division for Heart Disease and Stroke Prevention (5U50 DP000736-03) and through the Montana Department of Public Health and Human Services.

The mission of the Diabetes Control and Cardiovascular Health Programs is to reduce the burden of diabetes and cardiovascular disease among Montanans. Our web pages can be accessed at <http://www.diabetes.mt.gov> and <http://montanacardiovascular.state.mt.us>.

For further information please contact us at:

Section Manager <b>Mark Niebylski, PHD, MBA, MS</b> <a href="mailto:mniebylski@mt.gov">mniebylski@mt.gov</a>	CVH Program Manager <b>Crystelle Fogle, MS, MBA, RD</b> <a href="mailto:cfogle@mt.gov">cfogle@mt.gov</a>	Diabetes Program Manager <b>Karl Vanderwood, BS, MPH</b> <a href="mailto:kvanderwood@mt.gov">kvanderwood@mt.gov</a>	
Epidemiologist - Diabetes <b>Taryn Hall, MPH</b> <a href="mailto:thall@mt.gov">thall@mt.gov</a>	Epidemiologist - CVH <b>Carrie Oser, MPH</b> <a href="mailto:coser@mt.gov">coser@mt.gov</a>	CVH Quality Improvement Coordinator <b>Marilyn McLaury, MS, RD</b> <a href="mailto:mmclaury@mt.gov">mmclaury@mt.gov</a>	
Quality Improvement Coordinator Diabetes Program <b>Chris Jacoby, BSN, RN</b> <a href="mailto:cjacoby@mt.gov">cjacoby@mt.gov</a>	Quality Improvement Coordinator Diabetes Program <b>Elisabeth Mann, RN, CDE, CPT</b> <a href="mailto:elsmann2@yahoo.com">elsmann2@yahoo.com</a>	Health Education Specialist <b>Linda Krantz</b> <a href="mailto:lkrantz@mt.gov">lkrantz@mt.gov</a>	Diabetes Education Coordinator <b>Marci Butcher, RD, CDE</b> <a href="mailto:marcibutcher@msn.com">marcibutcher@msn.com</a>
	CVH Secondary Prevention Specialist <b>Michael McNamara, MS</b> <a href="mailto:mmcnamara@mt.gov">mmcnamara@mt.gov</a>	OR YOU MAY CALL: Financial Specialist <b>Susan Day</b> Phone: 406-444-6677 <a href="mailto:sday@mt.gov">sday@mt.gov</a>	Financial Specialist <b>Ava Griffenberg</b> Phone: 406-444-5508 <a href="mailto:agriffenberg@mt.gov">agriffenberg@mt.gov</a>

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